

Remarks**I. Status**

Claims 1-5 and 10-45 are pending in the application. Claims 18, 20, 25, 29, 30, 31, and 33 are amended. Claim 45 is added.

II. Telephone Interview

Applicant would like to thank the Examiner for conducting a telephone interview on November 8, 2007. Claim 1 was discussed in light of the cited art (Klein). In particular, the Examiner's statements (in the Office Action) that certain limitations of claim 1 are inherent in Klein was discussed. No agreement was reached.

III. Title

The title has been objected to for allegedly being not descriptive. The title has been amended as shown above.

IV. Claim Rejections - 35 U.S.C. § 112

Claim 25 has been rejected under 35 U.S.C. 112 as allegedly being indefinite. Claim 25 has been amended as shown above.

V. Claim Rejections - 35 U.S.C. § 102

Claims 1-2, 10-11, 13, 18, 20, 25-26, 28-29, 31-32, 34-35 and 37-44 have been rejected under 35 U.S.C. 102(b) as being allegedly anticipated by U.S. Patent No. 5,873,101 ("Klein").

Independent Claims 1 and 10

Independent claim 1 defines a method for replicating data from a storage device. Claim 1 requires “identifying on a storage device at least one data block comprising file data,” and “performing at least one read operation with respect to the at least one data block.” Claim 1 further requires “recording one or more I/O accesses performed with respect to the storage device in association with the at least one read operation,” “identifying, based on the recorded I/O access information, one or more data blocks on the storage device that contain valid data” and “replicating the data blocks that contain valid data.” Independent claim 10 is a system claim corresponding to claim 1.

Klein describes a method and system for backing up data and restoring data to a database. (Abstract). Data is stored in data segments comprising a plurality of blocks of data. Each data segment includes an “extent map” identifying the location and size of “extents” within the data segment. (Col. 4, lines 53-54). An extent is a logical storage structure including a specific number of contiguous data blocks. (Col. 4, lines 53-54).

Backing up a data segment from a first storage location to a second storage location involves copying the data blocks in the extents of each data segment, as well as the extent map, from a first location to a second location without analyzing the contents of either the data blocks or the extent map. (Col. 5, lines 1-6). Any suitable operating system routine or copy utility may be used to copy the data blocks. (Col. 5, lines 50-55). After the data blocks have been copied, location information in the data is corrected/updated. (Col. 5, lines 54-59). Therefore, it is important to maintain the original order of the data blocks in the extents so that location-dependent information contained in the data blocks can be accurately updated after it is copied. (Col. 5, lines 17-26).

Markers may be maintained within the extents to indicate boundaries between data blocks that have been allocated and are in use, and those allocated data blocks that have not yet been used. (Col. 5, lines 31-34). When data is copied during the backup procedure, the markers are used to ensure that only those allocated data blocks that are in use are copied. (Col. 5, lines 35-39). The markers may be stored as part of the extent map, or in the data segment separate from the extent map. (Col. 5, lines 37-40).

Klein does not explicitly teach “recording one or more I/O accesses performed with respect to the storage device in association with the at least one read operation,” as required by claims 1 and 10. There is no disclosure that the extent map is generated based on “reading one or more I/O accesses,” as required by claims 1 and 10. Klein does not provide any explanation of how the extent map is generated. A record of data blocks containing valid data, such as the extent map (with markers), may be generated in a variety of different ways. For example, existing storage systems generate a table of allocated data blocks, and continually update the table, as data is written in memory, or deleted from memory. Klein could use such a method to generate the extent maps. Therefore, “read operations” are not necessary in Klein to generate the extent map.

The Examiner appears to acknowledge that Klein does not show “recording one or more I/O accesses performed with respect to the storage device in association with the at least one read operation,” as required by claims 1 and 10, but argues that this limitation is inherent. Specifically, the Examiner alleges that “in order to determine whether the data block contains meaningful information or not, the particular data block needs to be read (i.e. I/O access by performing a read operation) first and to determine whether data exist (i.e. to identify whether it comprise the file data or not) in it or not and then each block get backed up by copying it to the

storage medium 250, i.e. read, i.e., I/O access is performed.” The applicants respectfully submit that the Examiner’s argument is improper.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. “To establish inherency, the extrinsic evidence ‘ must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities.” MPEP 2112, (IV). The extent map and markers (which indicate the locations of valid data) in Klein may have been generated as data was written to memory, as discussed above. Therefore, the Examiner’s argument is improper and should be withdrawn. If the Examiner continues to allege that Klein suggest “recording” I/O accesses, the applicants respectfully request that the Examiner provide evidence that this is done in Klein.

None of the other cited art teaches or suggests the combination of claims 1 and 10, either. Therefore, claims 1 and 10, and their respective dependent claims, are patentable over the cited art. The dependent claims include patentable limitations, as well.

Amended Claim 18

Independent claim 18 defines an apparatus to replicate data blocks on a storage device that contain valid data. Claim 18 requires a storage device configured to “store data in one or more data blocks.” Claim 18 has been amended to recite “wherein the storage system comprises a file system that identifies files stored on the storage device and storage location information for the respective files.” Claim 18 also requires a first processor configured to “record I/O accesses performed with respect to the storage device in association with read operations.” Claim 18 has

been further amended to require a second processor configured to “perform read operations with respect to all files identified in the file system” and “instruct the first processor to record one or more I/O accesses performed with respect to the storage device in association with the read operations.” Support for the amendments to claim 18 is found at page 4, lines 3-15 and at page 7, line 21 - page 9, line 5, for example.

For the reasons set forth above, Klein does not teach or suggest a processor configured to “record I/O accesses performed with respect to the storage device in association with read operations,” as claimed.

Klein also fails to teach or suggest a processor configured to “perform read operations with respect to all files identified in the file system” and “instruct the first processor to record one or more I/O accesses performed with respect to the storage device in association with the read operations,” as required by amended claim 18. While Klein discloses extent maps relating to respective data segments on a storage device, Klein does not explain how the extent map is created, as discussed above. The extent map is not a file system; Klein never even mentions files. Klein does not, therefore, teach reading all files identified in a file system and recording I/O accesses performed during such reading.

Even if the extent maps did inherently require “read operations” prior to their creation, as the Examiner alleges, it is not clear which data would be read to distinguish valid data from non-valid data. Would Klein’s system read a single data segment? Selected data blocks? All the data on the storage device? Using a file system, as claimed, is an efficient way to determine where files are located and thereby to identify valid data. There is no teaching or suggestion in Klein of performing read operations with respect to all the files identified in the file system, as required by amended claim 18.

None of the other cited art teaches or suggests the combination of amended claim 18, either. Therefore, amended claim 18 and its dependent claims are patentable over the cited art. The dependent claims include patentable limitations, as well.

Amended Claim 29

Independent claim 29 defines a method to identify data blocks on a storage device that contain valid data. Claim 29 requires “identifying on a storage device at least one data block comprising file data,” “performing at least one read operation with respect to at least one data block,” and “recording one or more I/O accesses performed with respect to the storage device in association with the at least one a read operation.” Claim 29 has been amended to require “generating a single list of all data blocks on the storage device that contain valid data based, at least in part, on the recorded I/O access information.” Support for the amendments to claim 18 is found at page 7, line 21 - page 9, line 5, for example.

For the reasons set forth above, Klein does not teach or suggest “recording one or more I/O accesses performed with respect to the storage device in association with the at least one a read operation,” as required by amended claim 29.

Klein also does not teach or suggest “generating a single list of all data blocks on the storage device that contain valid data based, at least in part, on the recorded I/O access information,” as required by amended claim 29. While Klein discloses an extent map (and markers) indicating where valid data resides within a particular data segment, nowhere does Klein teach generating a single list indicating all data blocks on a storage device that contain valid data, as claimed.

None of the other cited art teaches or suggests the combination of amended claim 19, either. Therefore, amended claim 19 and its dependent claims are patentable over the cited art. The dependent claims include patentable limitations, as well.

Independent Claims 32, 38, and 42

Each of the independent claims 32, 38, and 42 recites a limitation similar to the “recording one or more I/O accesses” limitation of claims 1 and 10. For the reasons set forth, none of the cited art teaches or suggests these limitations. Therefore, independent claims 32, 38 and 42, and their respective dependent claims, are also patentable over the cited art. The dependent claims include patentable limitations, as well.

VI. Claims Rejections - 35 U.S.C. § 103

A. Claims 3, 12, 21 and 27

Claims 3, 12, 21 and 27 have been rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Klein in view of U.S. Patent Application No. 2003/0195865 (Long). The rejection is respectfully traversed.

Claim 3 depends from independent claim 1. Claim 12 depends from independent claim 10. Claim 21 depends from independent claim 18. Claim 27 depends from independent claim 5. For the reasons set forth herein, claims 1, 5, 12 and 18 are patentable over the cited art. (Claim 5 is discussed below). Therefore, dependent claims 3, 12 and 21 are also patentable over the cited art. The dependent claims include patentable limitations, as well.

B. Claims 4-5, 14-17, 19 and 22-24

Claims 4-5, 14-17, 19 and 22-24 have been rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Klein in view of U.S. Patent No. 5,668,971 (“Neufeld”). The rejection is respectfully traversed.

Claim 4, which depends from independent claim 1, is allowable because claim 1 is patentable over the cited art, as discussed above. Claim 4 includes patentable limitations, as well.

Independent claim 5 contains certain limitations similar to those of claim 1. For example, claim 5 requires “causing the storage device to record one or more I/O accesses performed with respect to the storage device in association with the at least one read operation.” As discussed above, Klein does not teach or suggest these limitations. Neither does Neufeld. None of the other cited art teaches or suggests the combination of claim 5, either. Therefore, claim 5 is also patentable over the cited art.

Claims 14-17, which depend from claim 10, are allowable because claim 10 is allowable, as discussed above. The dependent claims include patentable limitations, as well.

Claims 19 and 22-24, which depend from independent claim 18, are allowable because claim 18 is allowable, as discussed above. The dependent claims include patentable limitations, as well.

C. Claims 30 and 33

Claims 30 and 33 have been rejected under 35 U.S.C. 103(a) as being allegedly unpatentable over Klein in view of U.S. Patent No. 6,757,778 (“Rietschote”). The rejection is respectfully traversed.

Claim 30, which depends from independent claim 29, is allowable because claim 29 is allowable, as discussed above. Claim 33, which depends from independent claim 32, is allowable because claim 32 is allowable, as discussed above. The dependent claims include patentable limitations, as well.

VII. New Claim 45

New claim 45 defines a method to replicate data stored in a storage system. New claim 45 requires “examining a file system associated with the storage system, wherein the file system specifies one or more files and identifies one or more storage locations associated with at least one of the one or more files.” New claim 45 further requires “reading each file specified in the file system” and “recording in a list an identifier of at least one storage location accessed in association with each read operation.” New claim 45 also requires, after at least one read operation is performed with respect to each file identified in the file system, “replicating data stored in each storage location identified in the list.” Support for new claim 45 is found at page 7, line 21 to page 9, line 5, for example.

None of the cited art teaches or suggests “reading each file specified in the file system,” as required by new claim 45. As discussed above, Klein does not mention files, and the extent map does not constitute a file system. As discussed above, using a file system, as claimed, is an efficient method to determine where files are located and thereby to identify valid data.

Furthermore, none of the cited art teaches or suggests “recording in a list an identifier of at least one storage location accessed in association with each read operation,” as required by new claim 45. While Klein may discuss merely recording data blocks during a copying procedure, nowhere does Klein show recording identifiers of storage locations in a list, in

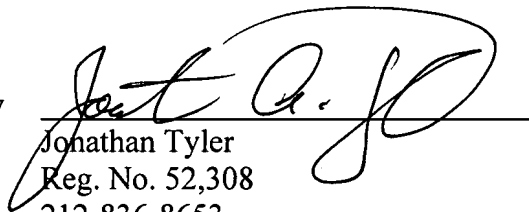
association with read operations, as claimed. None of the other cited art teaches or suggests these limitations, either. Therefore, new claim 45 is patentable over the cited art.

VIII. Conclusion

In view of the foregoing, each of claims 1-5 and 10-45, as amended, is believed to be in condition for allowance. Accordingly, reconsideration of these claims is requested and allowance of the application is earnestly solicited.

Respectfully submitted,
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